

the foregoing analysis, his attention is mainly concentrated upon decorative art, the reasoning he has employed must apply to other kinds; and, indeed, he shows in the course of the volume many instances of such application. The number and interest of the questions he suggests, forbid discussion in the space at my command. The extent of ground covered necessitates dealing in a summary manner with certain portions of the field. It cannot be helped. In a work of this kind it is more important to give glimpses of results beyond those actually worked out, than it is to establish a number of conclusions in detail. Prof. Haddon is fully alive to this; and while his conclusions, as far as they go, are in the main sound, and his exposition is clear and forcible, to fulfil the more important office he voluntarily foregoes much that would have added interest in the eyes of specialists, and perhaps in the eyes of others also. For the student every page will have its own suggestions. That humbler, but much more formidable, person, the general reader, for whom the book is also intended, if he be unacquainted with the writings of Holmes, Balfour, Dr. Colley March, and Count Goblet d'Alviella, will find himself in a new world. He cannot have a more trustworthy and companionable guide, with whom to commence its exploration, than Prof. Haddon.

Most of the figures are well and clearly reproduced; but a few of them would be greatly improved by the adoption of a larger scale. Some, such as the bamboo-pipes in Fig. 1, and Buddha's footprint in Fig. 130, are almost useless, on account of their diminutive size as compared with the intricacy of their patterns.

E. SIDNEY HARTLAND.

THE FLORA OF BOURBON.

Flore de l'Île de la Réunion [Bourbon] . . . avec l'Indication des Propriétés Économiques et Industrielles des Plantes. Par E. Jacob de Cordemoy. (Paris: 1895.)

THE appearance of Dr. Cordemoy's long-promised book on the flora of Bourbon will be welcomed with great satisfaction, as this was the only island of the Mascarene group proper of which the plants had not been worked out in detail. Dr. Cordemoy's work is not compiled on the same lines as the British Colonial Floras, and in some respects compares unfavourably with them; notably in the want of uniformity in treatment, and the absence of particulars of the general distribution of the plants. But the author has laboured under the great disadvantage of being remote from a botanical centre of literature and collections, and has done exceedingly well considering these drawbacks, except that, with his thirty-five years of experience, he might have given a much more interesting account of the vegetation, and a better summary of the facts brought to light by his investigations.

Mauritius and Bourbon, separated by about 100 miles, are nearly of the same extent; but the mountains of the latter rise to an altitude of nearly 9500 feet, or upwards of 6000 feet higher than those of Mauritius. This additional elevation adds a zone of vegetation to Bourbon which is practically unrepresented in Mauritius; yet there is no strictly Alpine element in the flora, and the

presence of native species of such genera as *Ranunculus*, *Stellaria*, and *Hypericum* hardly marks a cold climate. Perhaps the most striking thing in the flora of the two islands is the large number of characteristic genera and species common to both. For example, the indigenous palms of Bourbon are: *Hyophorbe indicâ*, *Dictyosperma alba*, *Acanthophænix rubra*, *A. crinita*, and *Latania Commersonii*. These are also, all of them, indigenous in Mauritius, and nowhere also. This is a strong contrast to the strictly endemic palm-vegetation of the Seychelles. On the other hand, Bourbon possesses a bamboo, *Nastus borbonicus*, which covers extensive areas at 4250 to 6500 feet, growing to a height of 35 to 50 feet. Excluding *Pandanus utilis*, four species of screw-pine are described; all endemic, and evidently constituting a prominent feature in the landscape, both on the sea-shore and high up on the mountains.

Other genera and species common and restricted to the two islands are: *Cossignia pinnata* (Sapindaceæ), *Grangeria borbonica* (Rosaceæ), and *Psiloxylon mauritianum* (Lythrarieæ?).

Among characteristic genera largely developed in both islands are *Dombeya* (Malvaceæ), *Quivisia* (Meliaceæ), and the shrubby *Psadia* (Compositæ). Among mountain shrubs of wide distribution within the African region, *Phylica nitida* and *Agauria salicifolia* are noteworthy. The former Cordemoy describes as a new species, with the remark that it may be the same as *P. mauritiana*. I have elsewhere¹ given my reasons, supported by the opinion of previous writers, for uniting the forms of *Phylica* inhabiting the Tristan da Cunha group, Amsterdam Island, Bourbon, and Mauritius under one species; and a further examination of the specimens does not alter that conviction. *Agauria salicifolia* is a common shrub on the mountains of Mauritius, Madagascar, and Continental Africa, westward to the Cameroons.

The discovery in Bourbon of *Bryodes micrantha* (Scrophularineæ) is interesting. It is a minute plant, only known at Kew from the one small specimen on which the genus was founded, collected in Mauritius by Bojer.

Hydnora africana, a root-parasite, found in some districts of South Africa, is recorded as common at Saint Paul, and as being known under the name of *Rose de Noël*. This is even more remarkable than the discovery of a new species of *Cytinus* in Madagascar.

As in Mauritius, so in Bourbon, gymnosperms are wholly wanting in the native and naturalised flora; and at present only one species each of *Podocarpus* and *Cycas* is known to inhabit Madagascar. They are both endemic. The phyllodineous *Acacia* (*A. heterophylla*), which has lately been recorded as introduced in Madagascar, and which is so near the Sandwich Islands *A. Koa*, as to be hardly distinguishable, if you did not know where your specimens came from, is said to be very common on the mountains, between about 3250 and 6500 feet. It is also common in Mauritius, and apparently undoubtedly native.

With regard to the total number of indigenous species of vascular plants, as compared with that of Mauritius, it is not easy to arrive at a satisfactory estimate, because many of the plants now commonest were probably introduced; but 1000 is, perhaps, below the actual number,

¹ "Botany of the Challenger Expedition," i. 2, p. 148.

as against 850 in Mauritius. The larger number may be accounted for by the greater elevation of Bourbon, as well as the divergencies in the numerical representation of the predominating natural orders. Some fourteen fewer natural orders are represented in Bourbon, but, in return, several orders are much more numerous represented.

It was known that Bourbon, as well as Mauritius, was exceedingly rich in ferns and orchids; yet few botanists will be prepared for the fact that orchids outnumber the two next highest orders combined. Orchids are absent or very rare in small remote islands, and comparatively rare in larger ones where there is a humid climate and rich vegetation; or even absent, Juan Fernandez, for example; and British India is the only large continental area, so far as I am aware, in which orchids predominate over any other order. Nearly 20 per cent. of the flowering plants of Bourbon are orchids; the total number described being 172 species, and the author expresses a doubt whether this is exhaustive. Three new genera are proposed, one, *Hemiperis*, comprising twenty-one species. Altogether seventy-two are described as new, and they are about half epiphytic and half terrestrial. Very few of these orchids are represented in the herbaria of this country, and, indeed, many of the other endemic plants of the island, especially the inconspicuous ones.

Dr. Cordemoy describes three or four new genera belonging to other orders, but mostly from somewhat imperfect materials. The most interesting is a labiate (*Mahya stellata*), supposed to be the only really indigenous member of the order, and exceedingly rare, being found only on the summit of the Grand Benard, at about 8500 feet. W. BOTTING HEMSLEY.

TECHNICAL EDUCATION.

The New Technical Educator. Vols v. and vi. (London, Paris, and Melbourne: Cassell and Co., Limited, 1895).

THESE are the concluding volumes of a valuable series of treatises on various technical subjects; the previous ones have already been noted in our columns. All the subjects are dealt with in an admirable manner, the author in each case being a specialist. The arrangement of the work is such that in most cases each volume contains information bearing upon a particular subject. A good index has been placed at the end of the last volume, and this very materially adds to the value of the work.

Prof. W. H. Greenwood's treatment of the manufacture of "Steel and Iron" is excellent. Commencing with the ores, he takes the reader through all the many processes in vogue, with ample illustrations and descriptions. The question of tests, however, appears to be generally overlooked. This is unfortunate, because it is of great importance both to the manufacturer and the engineer. In all modern specifications the quality of the material to be used is always stated, either in the form of mechanical or chemical tests.

Another well-written section is that on "the Steam Engine," by Archibald Sharp. In this case, also, the subject has been thoroughly dealt with from the beginning.

The illustrations and descriptions are of recent engines, and boilers. Of the latter, the water-tube type has not been overlooked; more might have been said, however, on the subject. The locomotive is represented by one of Mr. Worsdell's compounds, and we are told that "compound locomotives are being largely used." This statement is scarcely correct, because in this country, at any rate, they are at a discount. The same author has much to say on the subject of "Gas and Oil Engines." He omits to describe the porcelain ignition tubes now largely used in place of iron.

On "Engineering Workshop Practice," by several authors, we find much general information dealing with the engineering trades. Taken as a whole, the treatment flavours more of the amateur than of the tradesman. The same cannot be said of "Electrical Engineering," by Edward A. O'Keefe, because this subject occupies a prominent position in these volumes, having been particularly well written throughout. The last two volumes treat more particularly of the construction of incandescent lamps, accumulators and measuring instruments, concluding with descriptions of the microphone, telephone and phonograph, besides sundry details.

"Civil Engineering" has also been creditably treated from all points of view, the construction of roads naturally coming much to the front, and the praises of Telford and Macadam duly sung. An interesting account is included on the rise and progress of railways; when discussing probable speeds, we read: "The desire is now for higher speeds, and as much as 250 miles per hour is projected." This statement is far-fetched, and should have been omitted. The table giving train resistances, on p. 175, vol. v., would have been of more value had the authority been quoted. Further on, permanent way is discussed, and we are informed that "sleepers are never placed under the fish-joints." This statement is not correct. Another inaccuracy is found on page 297, where we read "that the driving-wheels of some locomotives have as much as twenty-five tons on them"; even the Great Northern people would probably plead "not guilty" to twenty tons on the driving-wheels of their famous single engines. Much useful information has been brought together under the heads of hydraulics, pumping machinery, lighthouses, ships, &c.

The "Dyeing of Textile Fabrics" is fully discussed, the author being Prof. J. J. Hummel, of the Yorkshire College; treated very much from a chemical point of view, dyers will find much to learn on this subject. In answer to the question, "What is technical education?" we find some sound remarks from the pen of Mr. Henry Cunynghame. He observes that the use of a knowledge of principles, as compared with the mere routine of the workshop, cannot be overrated; this is the distinguishing feature of the true mechanic from the factory hand. Much has been done of late years to encourage the formation of technical schools; but more must be done if we are to retain our present position as a manufacturing country. A knowledge of principles, both mechanical and chemical, is all-important; and these, in conjunction with machinery of the latest design, must surely tell in the race for trade.

The volumes before us will be of much use to those